Shropshire Associates LLC

SBE Certified

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November 21, 2024

Balkar Saini
14 Ponty Road
Monmouth Junction, NJ 08552

(via email: balkarsaini963@gmail.com)

Re: **Traffic Engineering Assessment – Phase 1**
Commercial Center – Elk Township
Buck Road (C.R. 553) and Elk Road (C.R. 538)
Elk Township, Gloucester County, New Jersey
SA Project No. 22158

Dear Mr. Saini:

At your request, Shropshire Associates, LLC prepared this traffic engineering assessment (TEA) to support applications to Elk Township and Gloucester County for the above referenced commercial development. The proposal is for the construction of a 4,180 square-feet (sf) convenience store with ten (10) fueling positions, three (3) diesel fueling positions, 24 parking spaces, and 28 truck parking spaces. The proposed development will be located on the southwest corner of Elk Road (CR 538) and Buck Road (CR 553) with frontage along eastbound Elk Road and along southbound Buck Road in Elk Township, Gloucester County, NJ.

Access to the proposed development will be provided via five (5) site driveways. One (1) full-movement driveway and one (1) right-turn ingress-only driveway are proposed along eastbound Elk Road (CR 538). Two (2) full-movement driveways and one (1) ingress-only driveway are proposed along southbound Buck Road (CR 553). Final approval for the driveways will be required from Gloucester County.

Existing Conditions

A field reconnaissance was conducted to determine the features of the adjacent roadway network within the study area. A description of the roadways and intersections within the study area are provided below.

Along the site's frontage, **Elk Road (CR 538)** is a two-lane roadway under Gloucester County jurisdiction and is classified[1] as an Urban Major Collector east of its intersection with Buck Road (CR 553) and a Rural Major Collector west of its intersection with Buck Road (CR 553). Elk Road has an approximate cartway width of 26 (foot) ft which consists of one (1) 11 ft travel lane and 2 ft shoulder in each direction. The posted speed limit along this section of Elk Road is 45 MPH. For the purpose of this study, Elk Road is assumed to extend in a general east-west direction.

Along the site's frontage, **Buck Road (CR 538)** is a two-lane roadway under Gloucester County jurisdiction and is classified as an Urban Major Collector north of its intersection with Elk

[1] NJDOT Straight Line Diagrams

Road (CR 538) and a Rural Major Collector south of its intersection with Elk Road (CR 538). Buck Road has an approximate cartway width of 32 ft which consists of one (1) 12 ft travel lane and 4 ft shoulder in each direction. The posted speed limit along this section of Buck Road is 50 MPH. For the purpose of this study, Buck Road is assumed to extend in a general north-south direction.

In the vicinity of the site, **Willow Grove Road/Aura Road (CR 667)** is a two-lane roadway under Gloucester County jurisdiction west of its intersection with Elk Road (CR 538) and under Elk Township jurisdiction east of its intersection with Elk Road (CR 538). Willow Grove Road extends from south of its intersection with Elk Road (CR 538) to its intersection with Buck Road (CR 553) where it becomes Aura Road to the west of its intersection with Buck Road (CR 553). Willow Grove Road/Aura Road is classified as an Urban Major Collector north of its intersection with Elk Road (CR 538) and a local road south of its intersection with Elk Road (CR 538). Willow Grove Road/Aura Road has an approximate cartway width of 26 ft which consists of one (1) 12 ft travel lane and 1 ft shoulder in each direction. The posted speed limit along this section of Willow Grove Road/Aura Road is 25 MPH. For the purpose of this study, Willow Grove Road/Aura Road is assumed to extend in a general north-south direction at its intersection with Elk Road (CR 538) and a general east-west direction at its intersection with Buck Road (CR 553).

The **Elk Road (CR 538)/Buck Road (CR 553)** signalized intersection is currently controlled by a two-phase semi-actuated traffic signal with a variable background cycle during the weekday AM, weekday PM, and Saturday peak hours. All approaches to the intersection consist of one (1) lane for left-turn movements and one (1) lane for shared through/right-turn movements.

The **Elk Road (CR 538)/Willow Grove Road (CR 667)** intersection is a four-way intersection that is stop-controlled along the northbound and southbound Willow Grove Road approaches. All approaches to the intersection consist of a single lane for all permitted movements.

The **Buck Road (CR 553)/Willow Grove Road-Aura Road (CR 667)** intersection is a four-way intersection that is stop-controlled along the eastbound Aura Road and westbound Willow Grove Road approaches. All approaches to the intersection consist of a single lane for all permitted movements.

Roadway Parking

Currently, there is no parking permitted along Elk Road, Buck Road, and Willow Grove Road/Aura Road in the vicinity of the existing site. No on-street parking is permitted in conjunction with our application. All proposed parking is off-street.

Roadway Geometrics

Based upon our review of the plans and field visits to the site, the roadway pavement in the vicinity of the site is generally in good condition outside of the areas to be replaced as part of the proposed widening and improvements. Sight distances at all site driveways will meet current AASHTO design criteria.

The existing Elk Road/Buck Road signalized intersection has been designed to generally provide for a desirable alignment between the roadways. In addition, all site driveways proposed to the adjacent roadway network will be aligned to provide for safe and efficient movements between the development and the adjacent roadway network.

Traffic Counts

Traffic counts were conducted at the study intersections during morning and evening commuter peak periods and the Saturday mid-day peak periods considered critical peak periods of analysis for the proposed commercial development. To determine the amount of traffic on the adjacent roadway, manual turning movement counts (MTMC) were conducted on a typical Thursday, January 11, 2024, at the study intersections. Additionally, counts were conducted on Saturday, January 13, 2024. The MTMCs were conducted during the morning (7:00 AM – 9:00 AM), afternoon (4:00 PM – 6:00 PM), and Saturday mid-day (11:00 AM – 2:00 PM) peak periods. The existing volumes are illustrated in Figure 1. The existing AM, PM, and Saturday traffic count data is attached for reference.

In addition to the MTMC data at the study intersection, as required by Gloucester County, automatic traffic recorders (ATR) were placed along Elk Road and buck Road in the vicinity of the proposed site driveways to collect hourly, daily, and weekly two-way traffic volumes. A copy of this data is attached to the end of this report for reference. The data collected indicates that the peak time of the existing County roadway occurs during the above-referenced peak periods when the intersection count was done.

Future Conditions

The traffic resulting from the proposed development will not affect the adjacent roadway network until it is fully built-out and occupied, which is anticipated to be by the year 2026. It can be expected that the traffic volumes along the adjacent roadways will increase as a result of general traffic growth in the vicinity of the site. Based on the *Annual Background Growth Table* prepared by NJDOT, a 1.25% annual traffic growth will occur along Elk Road. Buck Road, and Willow Grove Road/Aura Road north of Elk Road and 1.00% annual traffic growth will occur along Willow Grove Road south of Elk Road in the vicinity of the site. To be conservative the 1.25 % growth rate was used for all roadways. The projected 2026 No-Build volumes are illustrated on Figure 2.

ITE Trip Generation

The proposal is for the initial construction of a 4,180 square-feet (sf) convenience store with ten (10) fueling positions, three (3) diesel fueling positions, 24 parking spaces, an 28 truck parking spaces. The amount of traffic to be generated by the proposed convenience store with gas development can best be determined by using data published by the Institute of Transportation Engineers (ITE). ITE has compiled data from thousands of studies for various land uses, independent variables, and study periods and published the results in *Trip Generation, 11th Edition*. The development is most similar to ITE Land Use 945: Convenience Store/Gas Station and ITE Land Use 950: Truck Fueling.

The traffic to be generated by the proposed convenience store with gas will be a combination of new trips and pass-by trips to the roadway system. A new trip is a trip whose primary purpose for being on the roadway is to patronize the development. A pass-by trip consists of a motorist who is already on the roadway with another trip purpose (i.e. home/work trip) and stops into the facility on their way.

Pass-by trips reduce the development's impact on the roadway since these trips consist of motorists that are already driving along the adjacent roadway network and are captured in the existing MTMC data. Using the ITE and NJDOT approved pass-by rates, the proposed convenience store with gas will have pass-by rates of 76% in the AM peak hour, 76% in the PM

peak hour, and 50% in the Saturday midday peak hour. The projected total, pass-by, and new trips to be generated by the proposed convenience store with gas and truck fueling facility are indicated in Table 1.

Table 1
ITE Trip Generation – Commercial Center - Elk

Land Use	AM Peak Hour			PM Peak Hour			SAT Peak Hour		
	In	Out	Total	In	Out	Total	In	Out	Total
New Trips									
Truck Fueling (3 Fueling Positions)	21	21	42	25	21	46	25	21	46
Convenience Store with Gas (10 Fueling Positions)	19	20	39	22	22	44	43	43	86
Total New Trips	40	41	81	47	43	90	68	64	132
Pass-By Trips									
Convenience Store with Gas (10 Fueling Positions)	61	61	122	70	70	140	42	42	84

The site traffic must then be distributed to the adjacent roadway network based on circulation patterns which site generated traffic can be expected to travel to and from the site. As required by Gloucester County, the site traffic was assigned to the roadway network based on a 5-mile gravity model analysis of the surrounding municipalities and population densities in the vicinity of the site. A copy of the gravity model analysis is attached for your review, with the site traffic distribution percentages shown in Figure 3. The resulting site traffic assignments for the diesel fuel and convenience store/gas station are illustrated on Figures 4A, 4B, 4C, 4D, and 4E. In order to project the future Build traffic conditions, the No-Build traffic volumes (Figure 2) were combined with the total site traffic (Figure 4E). The Build traffic volumes are illustrated on Figure 5.

Operational Analysis

In order to measure the quality of the traffic flow for the adjacent roadways and intersections, capacity analyses for the study intersections have been completed based upon the methods outlined in the *2010 Highway Capacity Manual*. Capacity analysis is a procedure used to estimate the ability of the roadway network to carry traffic. Capacity analyses are performed based on a Level of Service methodology. Level of Service (LOS) is a qualitative measure that characterizes the operational conditions of a roadway or intersection based on the perceptions by motorists and passengers. Levels of Service are defined for each type of facility (i.e. freeways, highways, signalized intersections, unsignalized intersections). These Levels of Service range from LOS A to LOS F, with a LOS A representing the best operating conditions and a LOS F representing the worst operating conditions.

The Levels of Service for signalized intersections are classified in terms of delay, which is based on the extent of driver discomfort and frustration, fuel consumption and lost travel time. The delay experienced by a motorist consists of many factors that relate to control, geometrics

and traffic. Some of these factors include the quality of progression, traffic signal cycle length, the green ratio and the volume-to-capacity ratio. The determination for the Level of Service for an unsignalized intersection is based upon the average control delay associated with each minor movement (i.e. yielding left-turn movements from the major roads and stop-controlled movements from the minor approaches). The Level of Service criteria for signalized and unsignalized intersections is summarized below in Table 2.

Table 2
Level of Service Criteria

Level of Service	Unsignalized Delay (sec)	Signalized Delay (sec)
A	≤ 10	≤ 10
B	> 10 and ≤ 15	> 10 and ≤ 20
C	> 15 and ≤ 25	> 20 and ≤ 35
D	> 25 and ≤ 35	> 35 and ≤ 55
E	> 35 and ≤ 50	> 55 and ≤ 80
F	> 50	> 80

In order to assess the traffic impact of the proposed residential development, the study intersections were evaluated under the existing conditions, and future No-Build and Build conditions using the above-described methodology. A detailed description of the study intersection's operations under these scenarios is provided below with the resulting Existing, No-Build and Build Levels of Service illustrated on Figures 6, 7, and 8; respectively. The capacity analysis worksheets are attached for reference.

Elk Road (CR 538) and Buck Road (CR 553) Intersection

Under the existing conditions, the Elk Road and Buck Road signalized intersection operates with an overall LOS B during both the weekday AM and the weekday PM peak hours and an overall LOS A during the Saturday peak hour. All individual movements will operate at LOS B or better during the weekday AM, weekday PM, and Saturday peak hours with the exception of the eastbound Elk Road left-turn movements which operate with an LOS C during the weekday AM peak hour.

Under the future No-Build and Build conditions, the intersection will continue to operate with an overall LOS B during both the weekday AM and the weekday PM peak hours and an overall LOS A during the Saturday peak hour. All individual movements will continue to operate with existing levels of service during all peak hours.

Elk Road (CR 538) and Willow Grove Road (CR 667) Intersection

Under the existing conditions, the eastbound and westbound Elk Road left-turn movements operate with LOS A during the weekday AM, weekday PM, and Saturday peak hours. The northbound and southbound Willow Grove Road shared left-turn/through/right-turn movements operate with LOS B during the weekday AM, weekday PM, and Saturday peak hours.

Under the future No-Build and Build conditions, all movements at the intersection will continue to operate with existing levels of service during all peak hours.

Buck Road (CR 553) and Willow Grove Road - Aura Road (CR 667) Intersection

Under the existing conditions, the northbound and southbound Buck Road left-turn movements operate with LOS A during the weekday AM, weekday PM, and Saturday peak hours. The eastbound and westbound Willow Grove Road - Aura Road shared left-turn/through/right-turn movements operate with LOS B during the weekday AM, weekday PM, and Saturday peak hours with the exception of the eastbound Willow Grove Road - Aura Road shared left-turn/through/right-turn movements which operate with LOS C during the weekday PM peak hour.

Under the future No-Build conditions, all individual movements at the intersection will continue to operate with Existing levels of service.

Under the future Build conditions, the eastbound Willow Grove Road/Aura Road shared left-turn/through/right-turn movements will operate with LOS C during the weekday AM peak hour. The westbound Willow Grove Road and Aura Road shared left-turn/through/right-turn movements will operate with LOS C during the weekday PM peak hour. All other individual movements at the intersection will operate with Existing levels of service.

Elk Road (CR 538) and Site Driveway #1 Intersection

Under the Build conditions, a new stop-controlled full-movement Site Driveway #1 will be constructed along eastbound Elk Road. All movements at the intersection will operate with a LOS A during the weekday AM, weekday PM, and Saturday peak hours. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

A left-turn lane warrant analysis was performed for westbound Elk Road at the proposed Site Driveway #1 intersection location. Based upon the future weekday AM, weekday PM, and Saturday peak hour volumes and the Highway Research Board Number 211 guidelines, a left-turn lane is **not warranted** for westbound Elk Road during the peak hour conditions. The AM, PM, and Saturday peak hour warrant graphs are attached for your review.

Elk Road (CR 538) and Site Driveway #2 Intersection

Under the Build conditions, a new right-turn ingress-only Site Driveway #2 will be constructed along eastbound Elk Road. As there are no stop-controlled or conflicting movements, levels of service are not available for this intersection. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

Buck Road (CR 553) and Site Driveway #3 Intersection

Under the Build conditions, a new right-turn ingress-only Site Driveway #3 will be constructed along southbound Buck Road. As there are no stop-controlled or conflicting movements, levels of service are not available for this intersection. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

Buck Road (CR 553) and Site Driveway #4 Intersection

Under the Build conditions, a new stop-controlled full-movement Site Driveway #4 will be constructed along southbound Buck Road. All movements at the intersection will operate with

LOS B or better during the weekday AM, weekday PM, and Saturday peak hours. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

A left-turn lane warrant analysis was performed for northbound Buck Road at the proposed Site Driveway #4 intersection location. Based upon the future weekday AM, weekday PM, and Saturday peak hour volumes and the Highway Research Board Number 211 guidelines, a left-turn lane is **not warranted** for northbound Buck Road during the peak hour conditions. The AM, PM, and Saturday peak hour warrant graphs are attached for your review.

Buck Road (CR 553) and Site Driveway #5 Intersection

Under the Build conditions, a new stop-controlled full-movement Site Driveway #5 will be constructed along southbound Buck Road. All movements at the intersection will operate with LOS B or better during the weekday AM, weekday PM, and Saturday peak hours. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

A left-turn lane warrant analysis was performed for northbound Buck Road at the proposed Site Driveway #5 intersection location. Based upon the future weekday AM, weekday PM, and Saturday peak hour volumes and the Highway Research Board Number 211 guidelines, a left-turn lane is **not warranted** for northbound Buck Road during the peak hour conditions. The AM, PM, and Saturday peak hour warrant graphs are attached for your review.

Conclusion

Based upon the data and analysis provided in this traffic engineering assessment, the traffic resulting from the proposed commercial development will not have significant impact on the adjacent roadway network based upon the following conclusions:

- The proposed convenience store with gas and diesel with tractor trailer parking development will generate 81 new trips during the weekday AM peak hour, 90 new trips during the weekday PM peak hour, and 132 new trips during the Saturday peak hour. These trips will be distributed among the five (5) proposed driveways.

- Under the Build conditions, the Elk Road (CR 538) and Buck Road (CR 553) signalized intersection will continue to operate with an overall LOS B during both the weekday AM and the weekday PM peak hours and an overall LOS A during the Saturday peak hour. All individual movements at the intersection will continue to operate with Existing levels of service, LOS C or better during all peak hours.

- Under the Build conditions, all individual movements at the Elk Road (CR 538) and Willow Grove Road (CR 667) intersection continue to operate at existing levels of service of LOS B or better during all peak hours.

- Under the Build conditions, all individual movements at the Buck Road (CR 553) and Willow Grove Road - Aura Road (CR 667) intersection will operate with LOS C or better during all peak hours.

- Under the Build conditions, five (5) site driveways will be constructed with two (2) located along eastbound Elk Road (CR 538) and three (3) being located along southbound Buck Road (CR 553). All individual movements at the proposed site driveway locations will operate with a LOS B or better during all peak hours. Left-turn warrant analysis were performed for the site full-movement site driveways and left-turn lanes were not warranted during all peak hours under the Build conditions. Final approval is required from Gloucester County with regards to the location, design, and operation of these driveways.

Please call if you have any questions.

Sincerely,
Shropshire Associates LLC

A Andrew Feranda

A Andrew Feranda, PE, PTOE, CME
Professional Engineer
N.J. License No. 42893
AAF/jab
Enclosures

cc: *David DeClement, Esq.* *(via email: DMDeClement@aol.com)*
Michael Textores, PE *(via email: MTextores@VanCleefEngineering.com)*
Jassi Balkar *(via email: Balkar86@gmail.com)*

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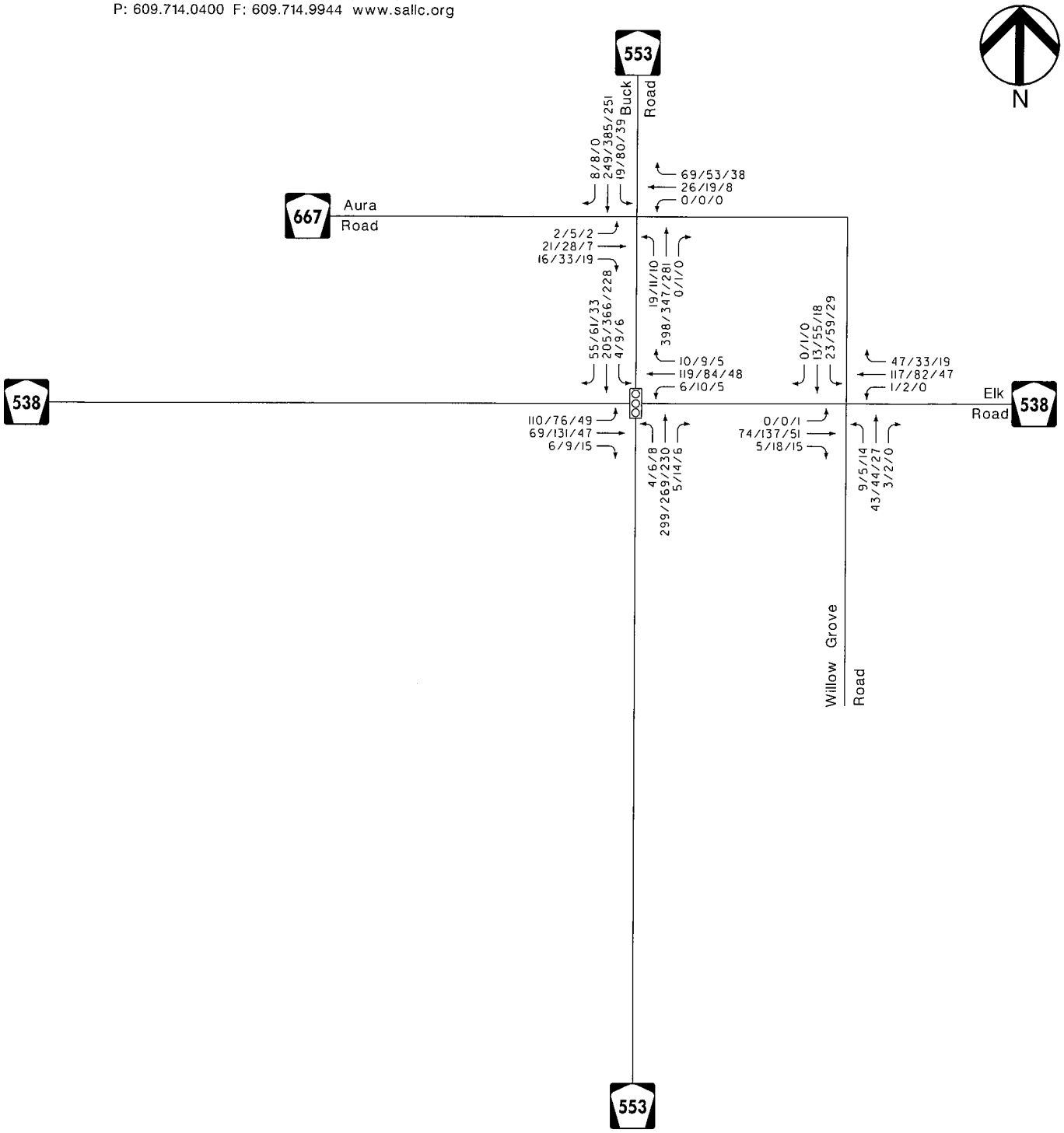
FIGURE 1
EXISTING VOLUMES



Truck Stop & Convenience With Gas

Elk Township, Gloucester County, New Jersey
November 2024

TRAFFIC SIGNAL

AM/PM/SAT PEAK HOUR

SA Project No. 22158

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FIGURE 2
NO-BUILD VOLUMES

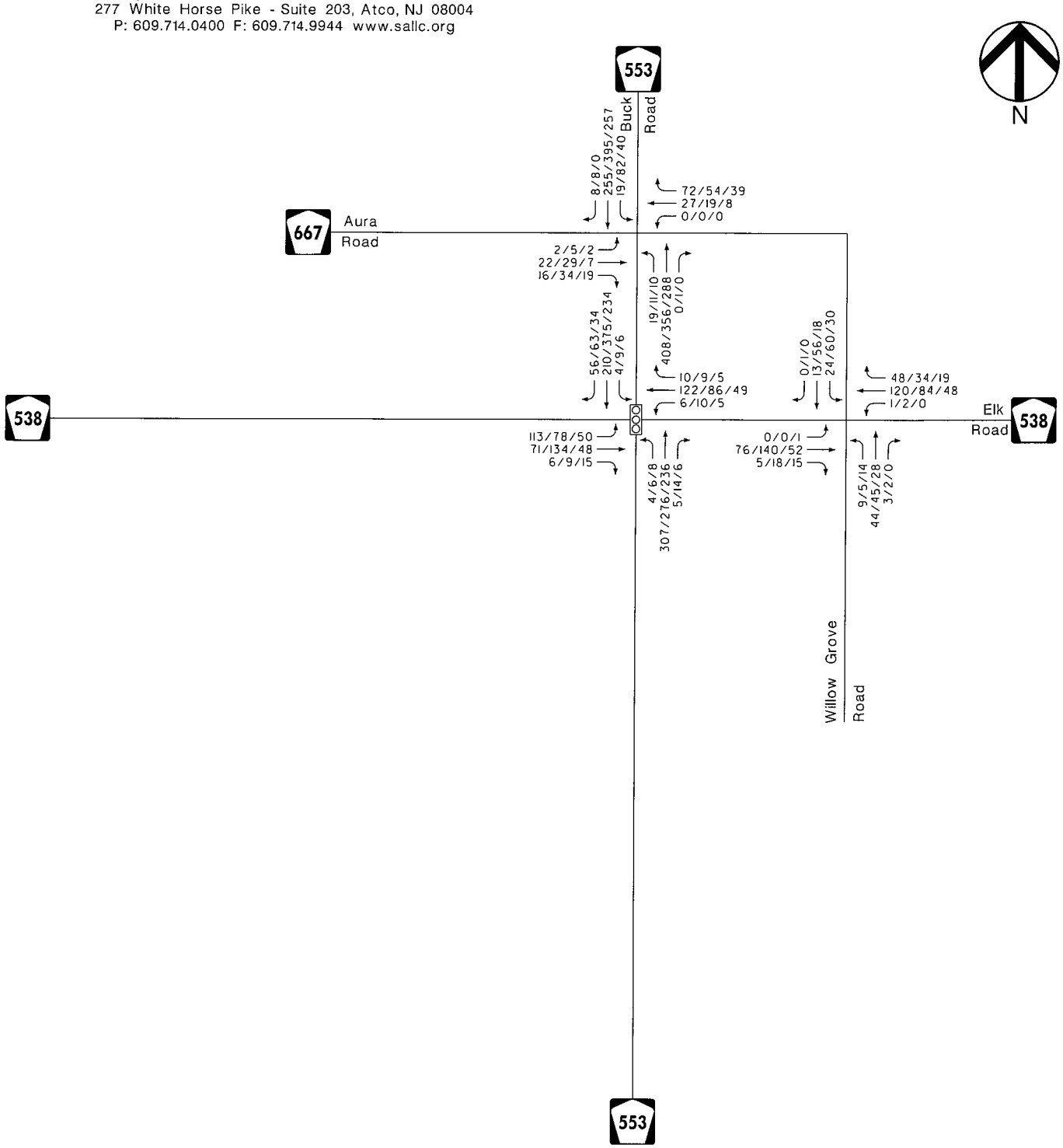

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FIGURE 3
TRIP DISTRIBUTION

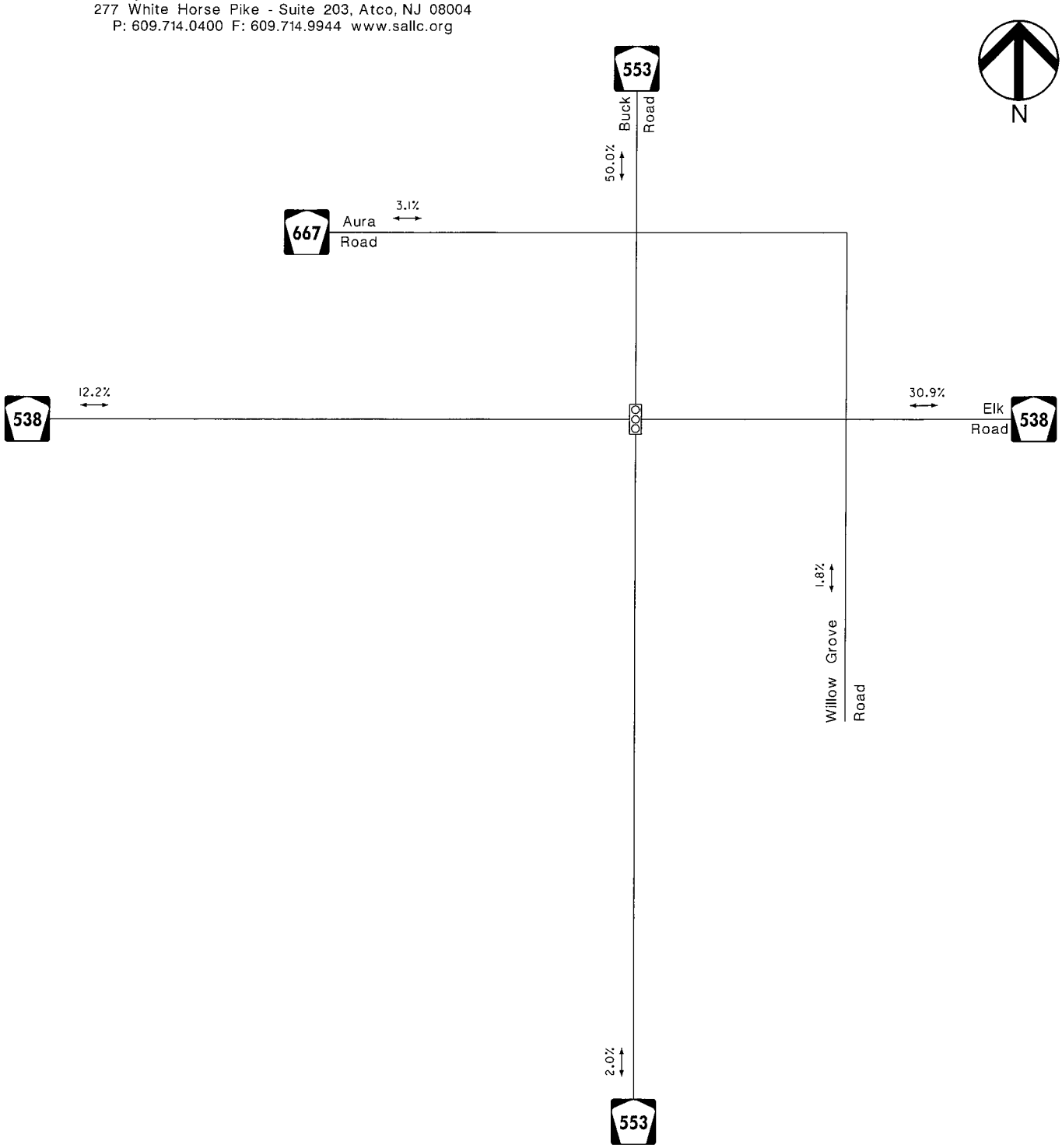

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FIGURE 4A
SITE TRAFFIC
(DIESEL FUEL)

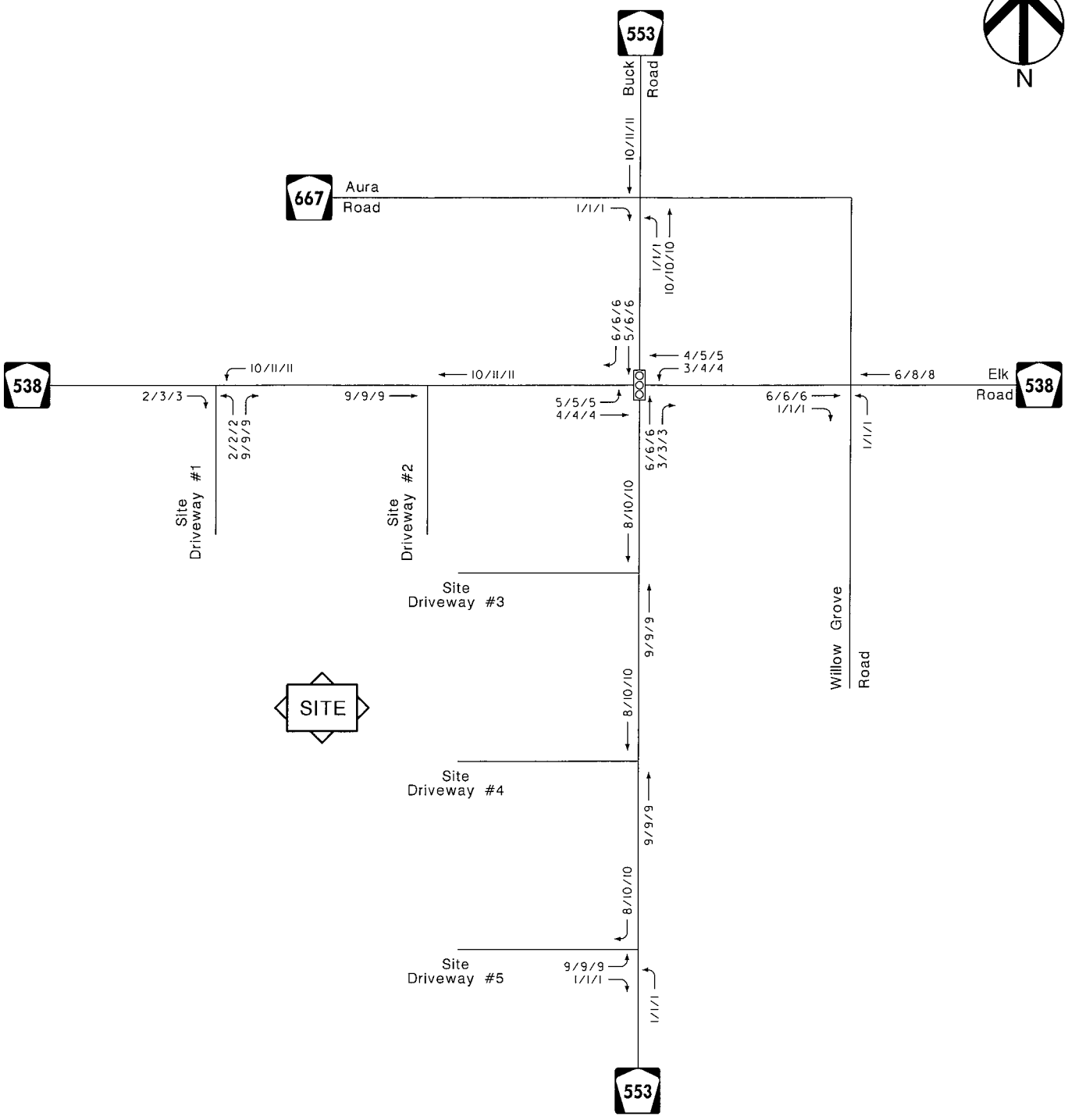

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FIGURE 4B
SITE TRAFFIC
(CONVENIENCE/GAS PASS-BY TRIPS)

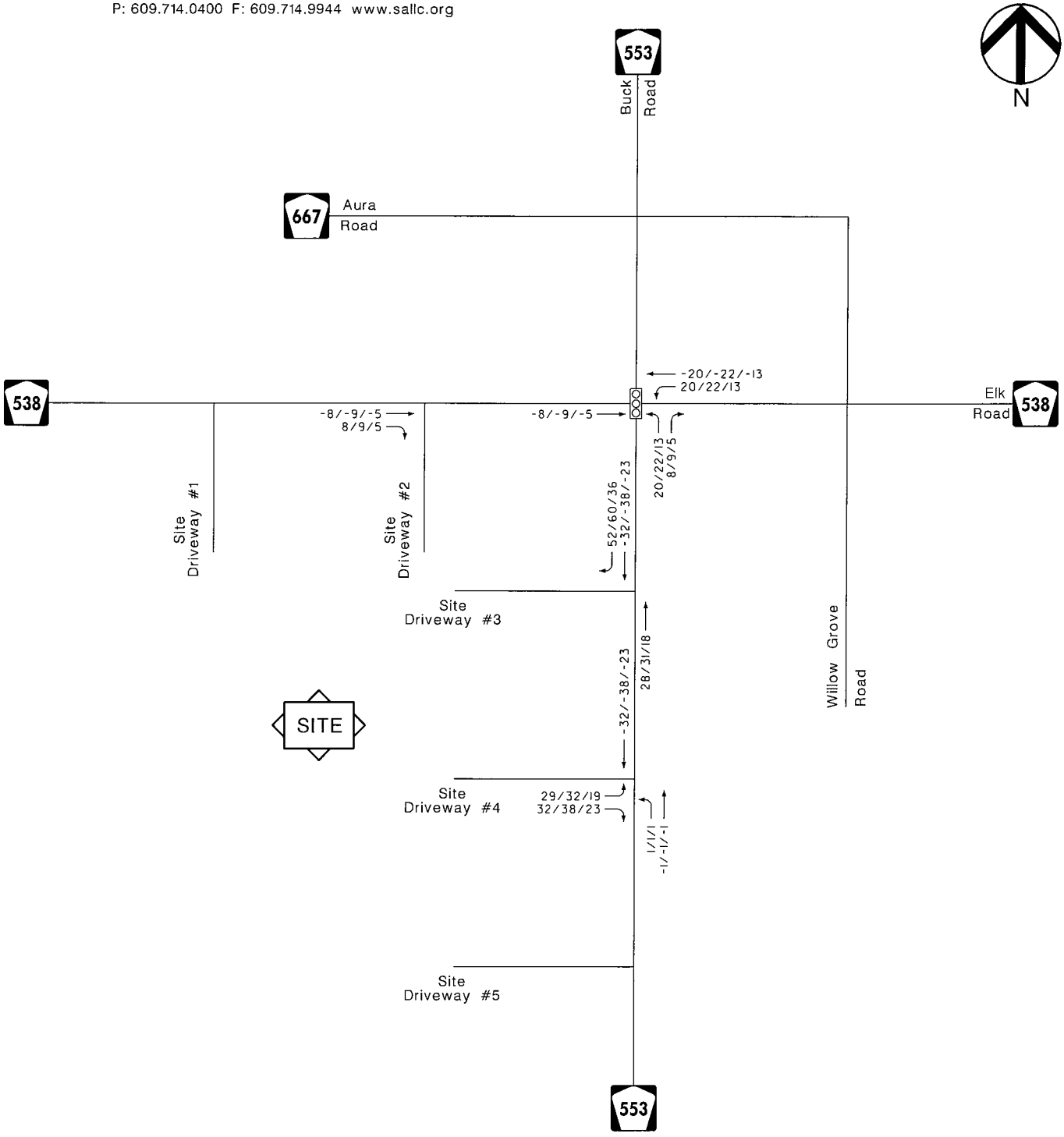

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FIGURE 4C
SITE TRAFFIC
(CONVENIENCE/GAS NEW TRIPS)

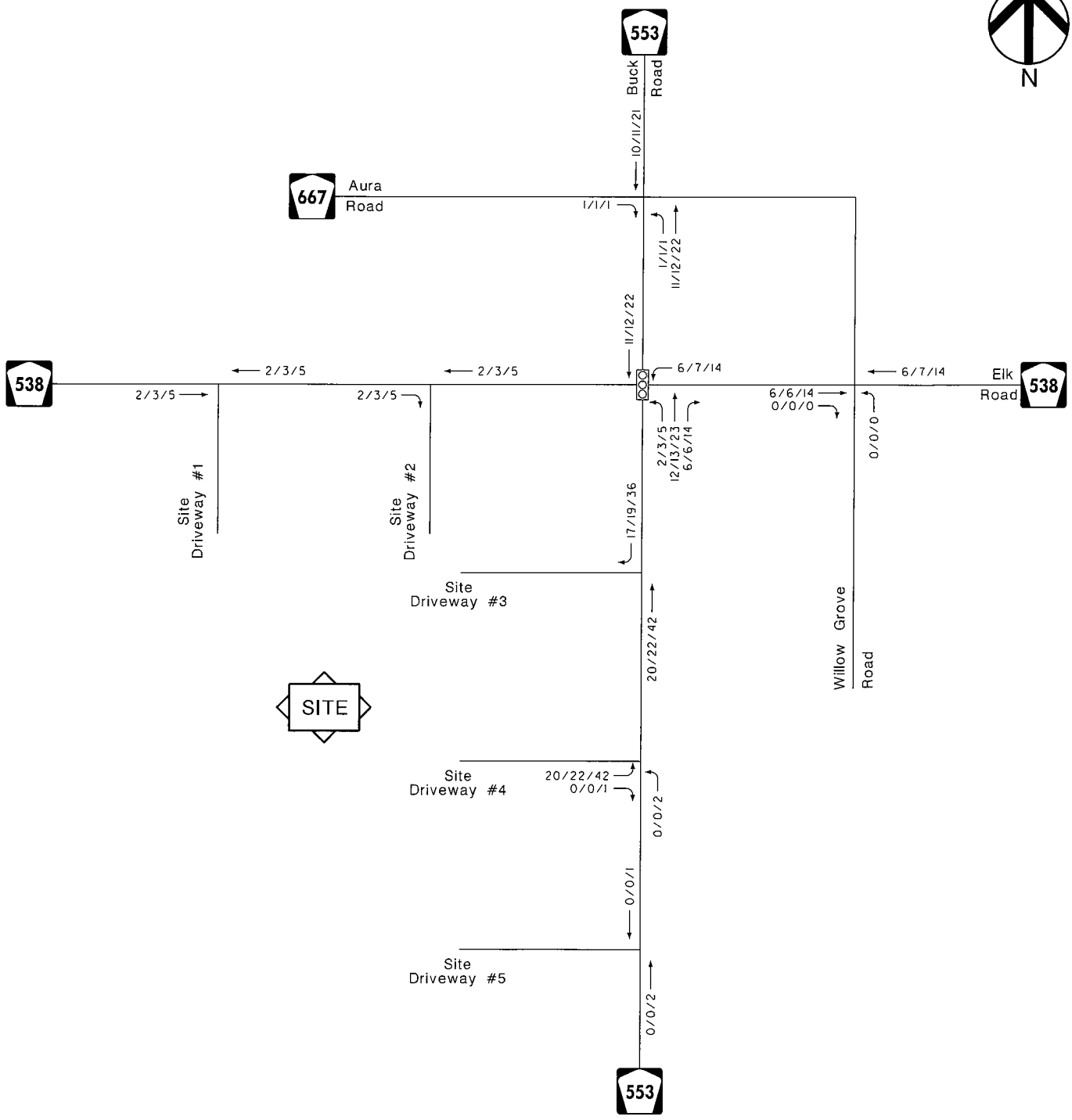

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FIGURE 4D
SITE TRAFFIC
(CONVENIENCE/GAS TOTAL)

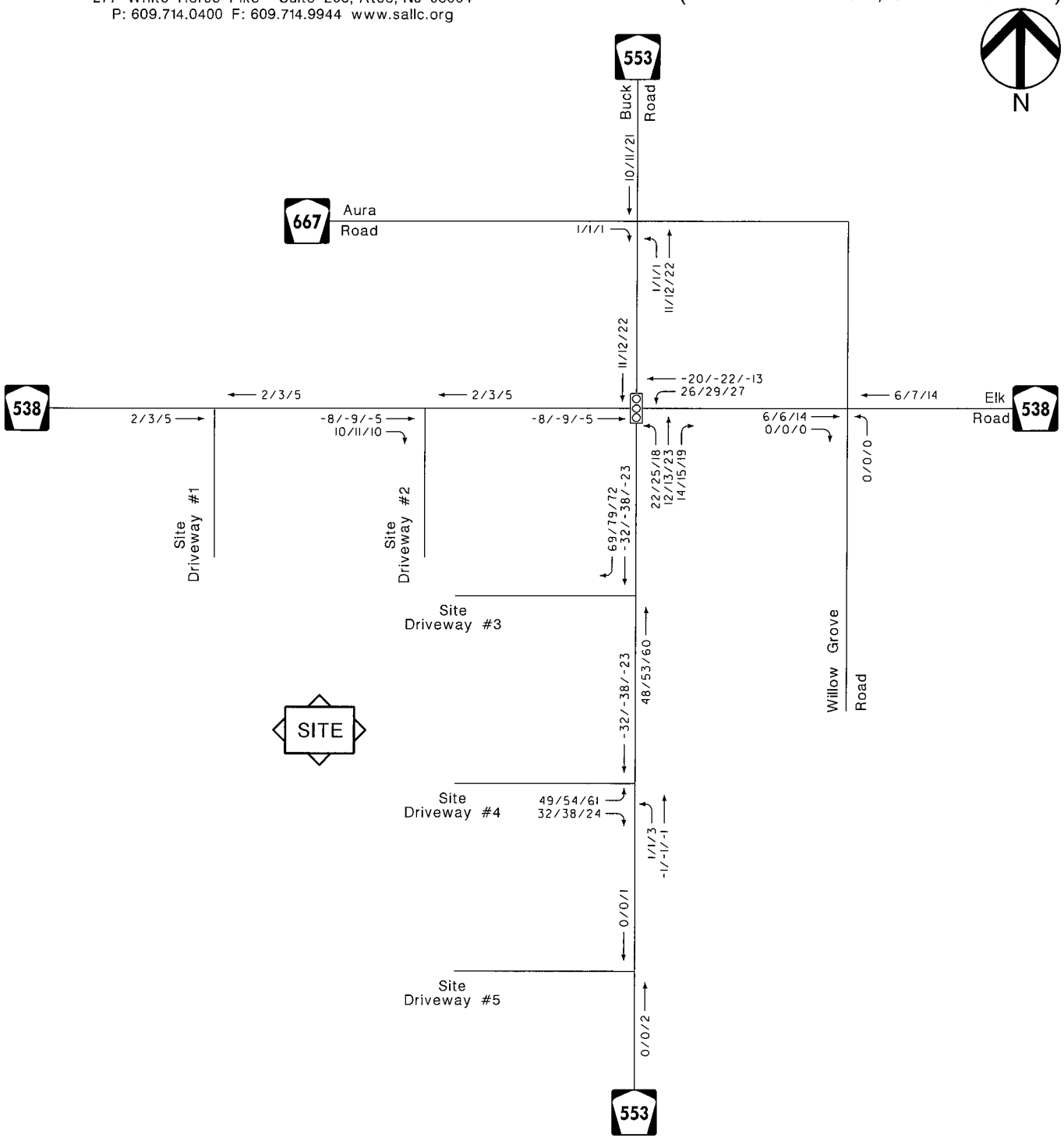

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FIGURE 4E
SITE TRAFFIC
(TOTAL)

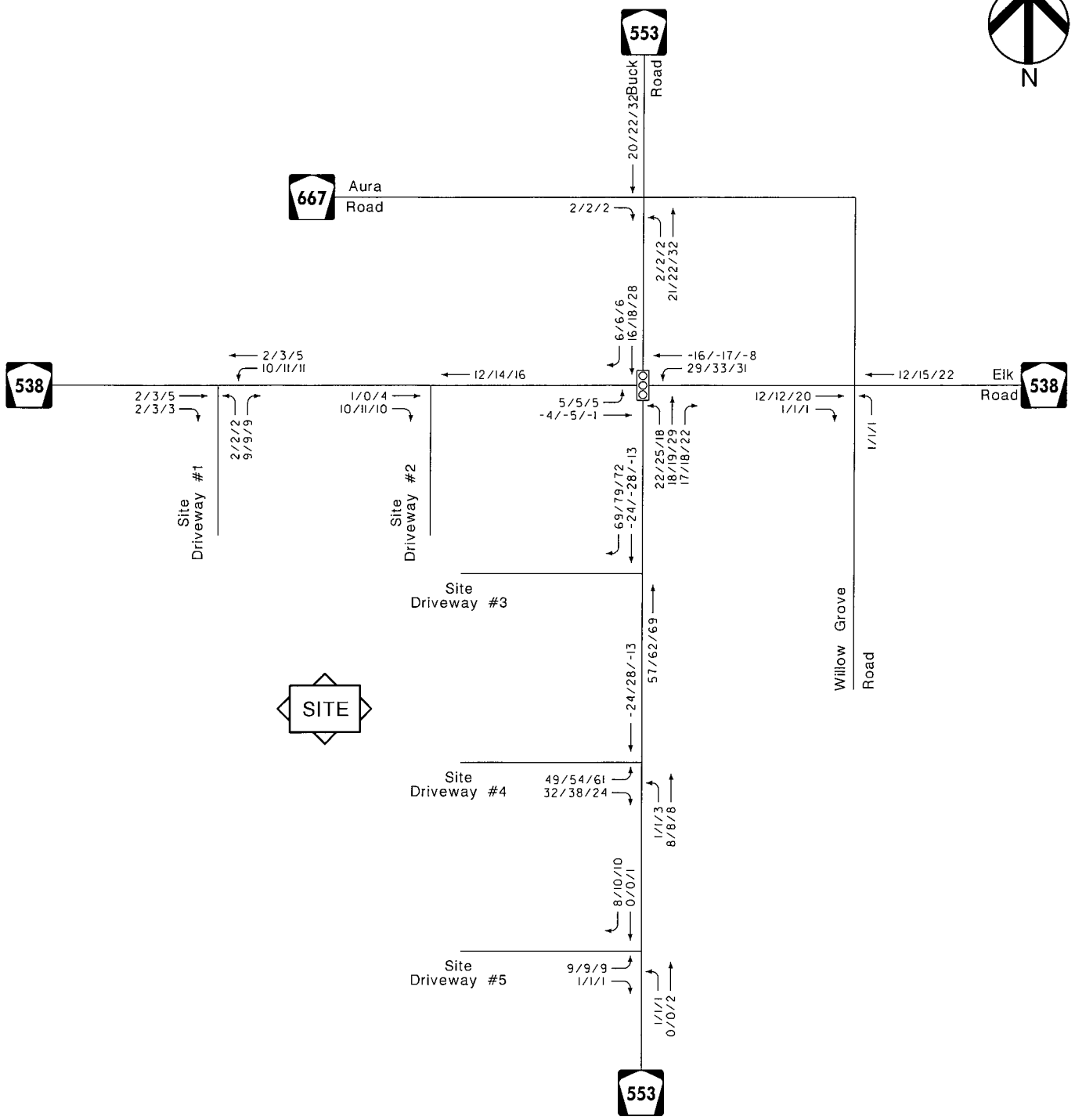

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FIGURE 5
BUILD VOLUMES

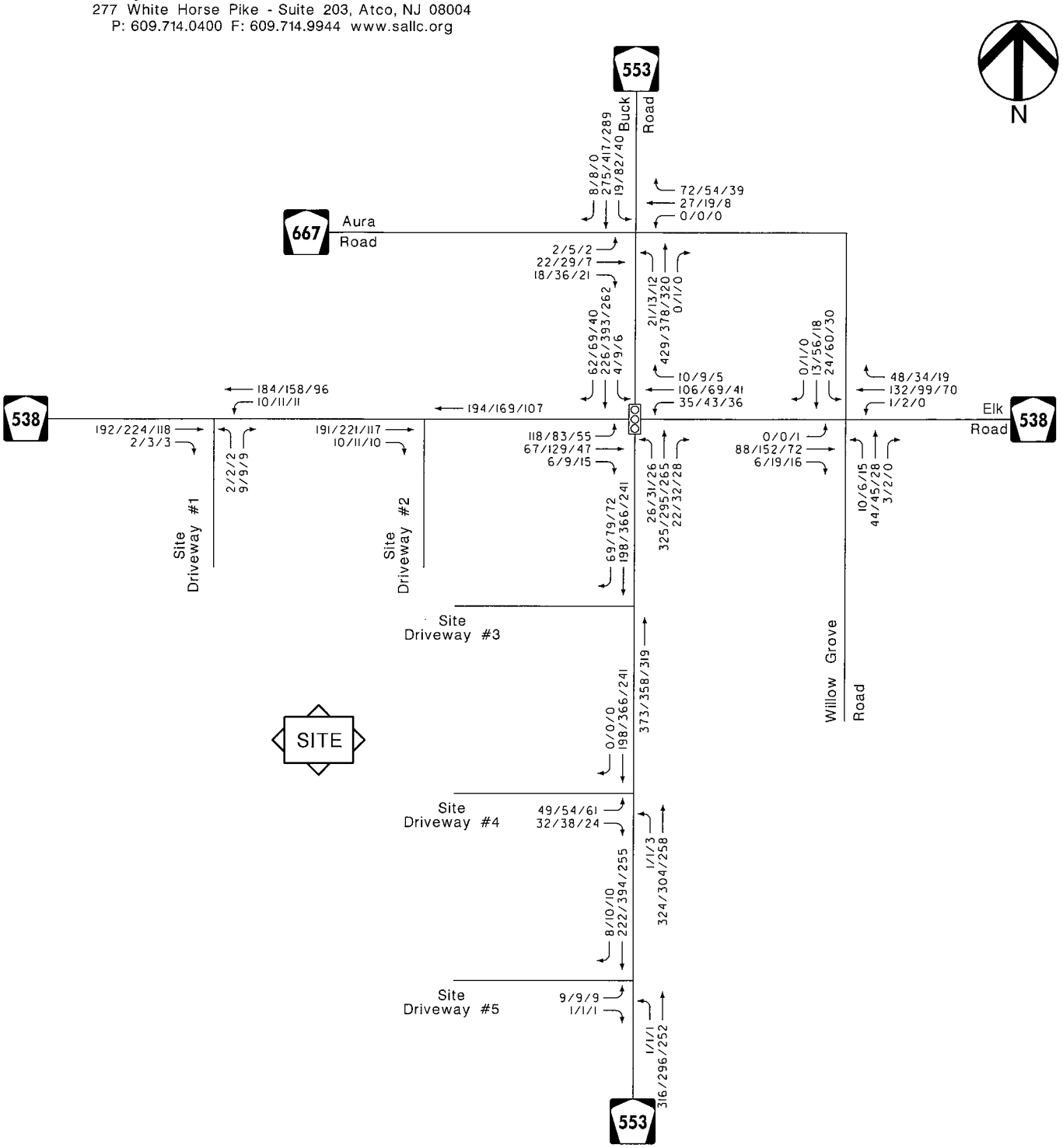

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FIGURE 6
EXISTING LEVELS OF SERVICE

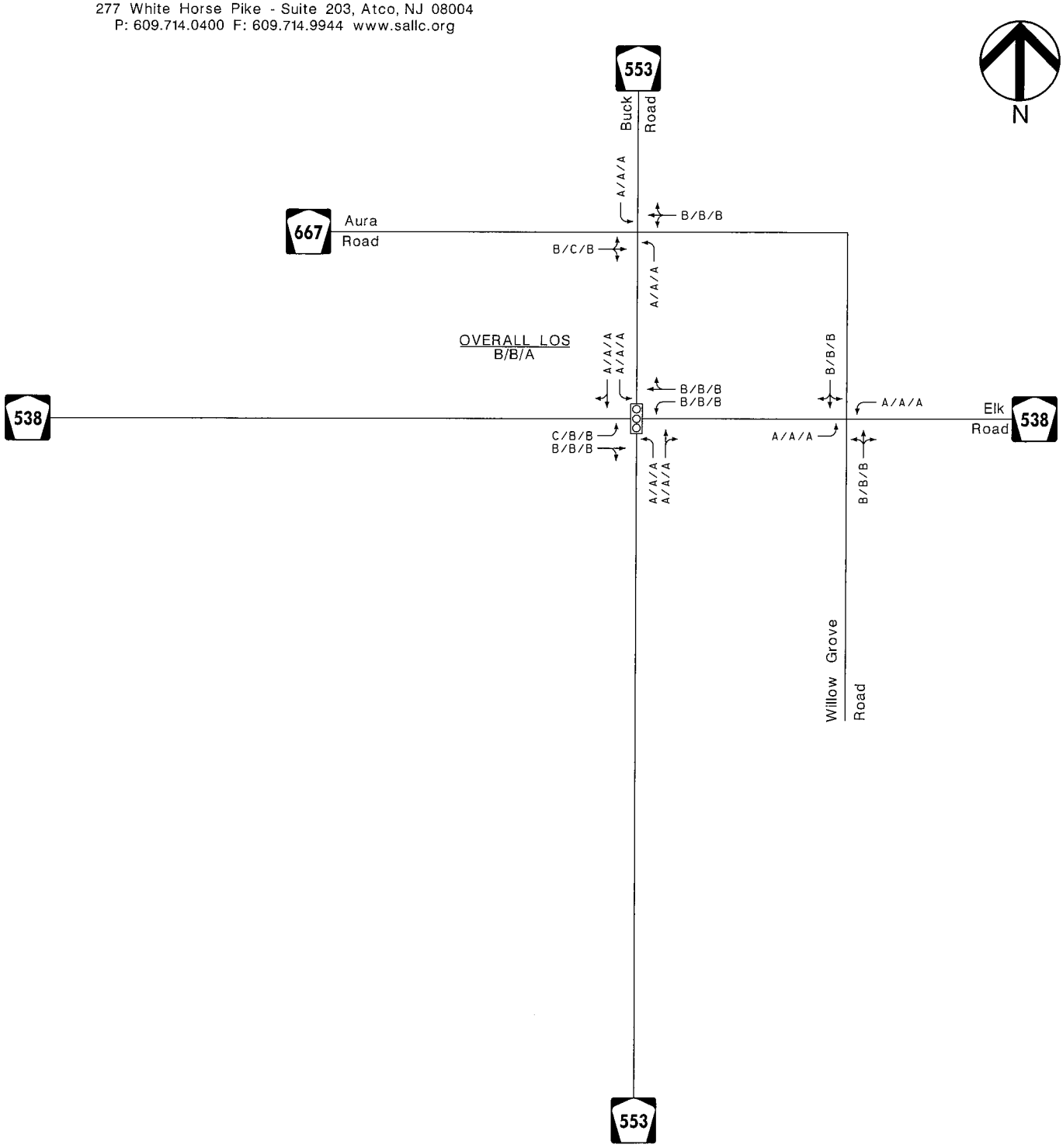

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FIGURE 7
NO-BUILD LEVELS OF SERVICE

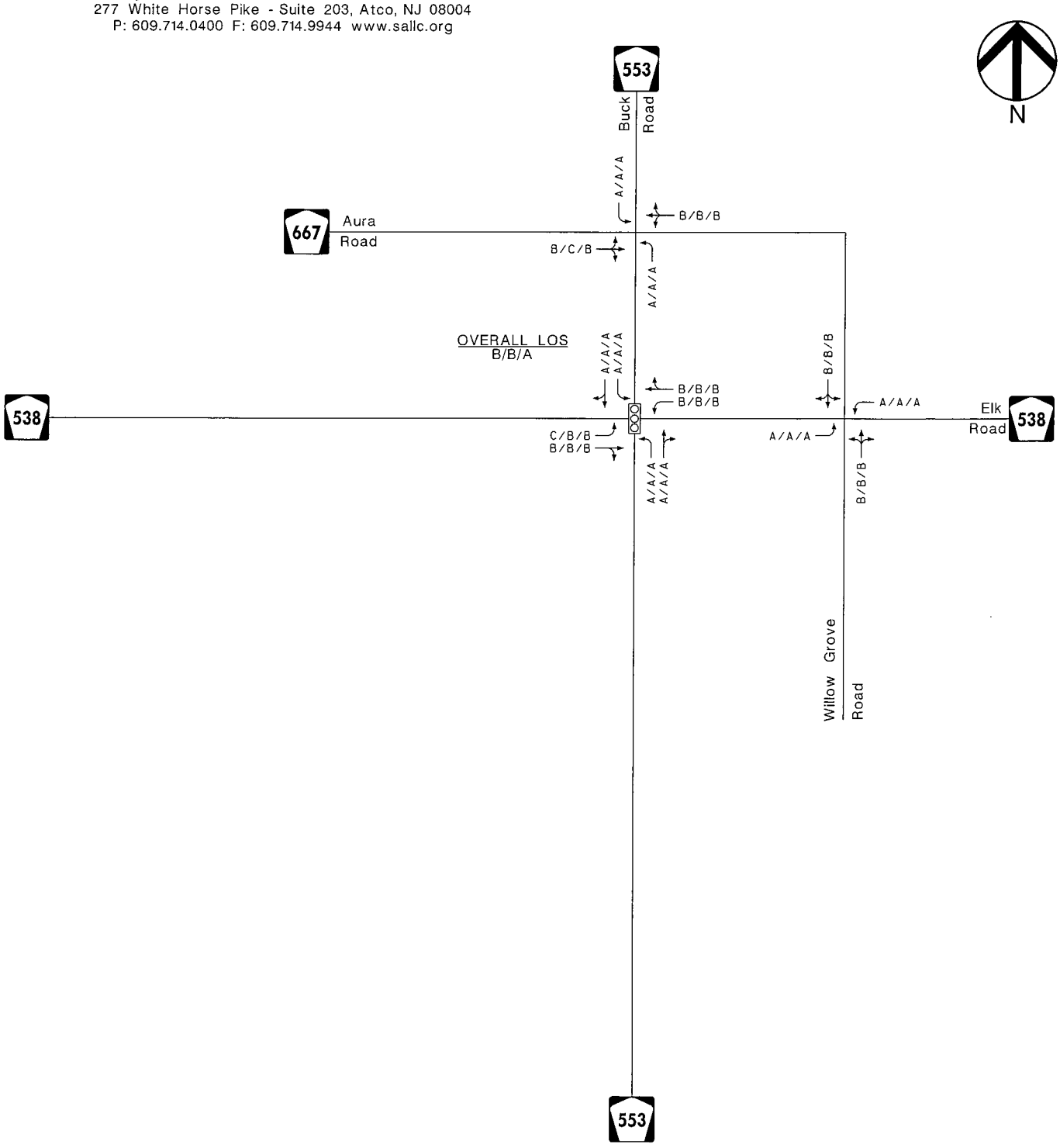

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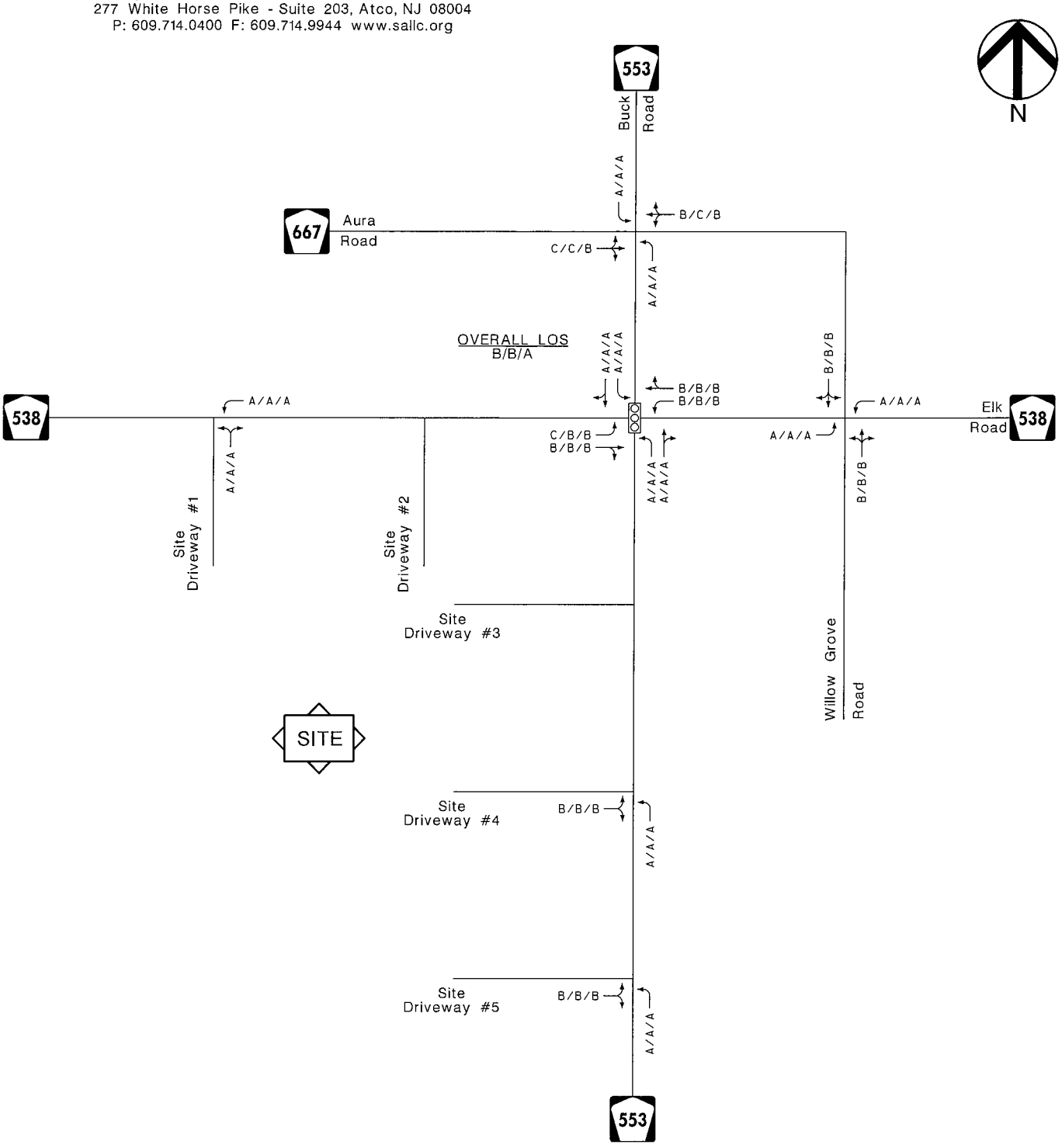
FIGURE 8
BUILD LEVELS OF SERVICE



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